SolarCity

CAISO/CPUC Joint Workshop

May 3, 2016

Multi-Use Applications

- **Vision**

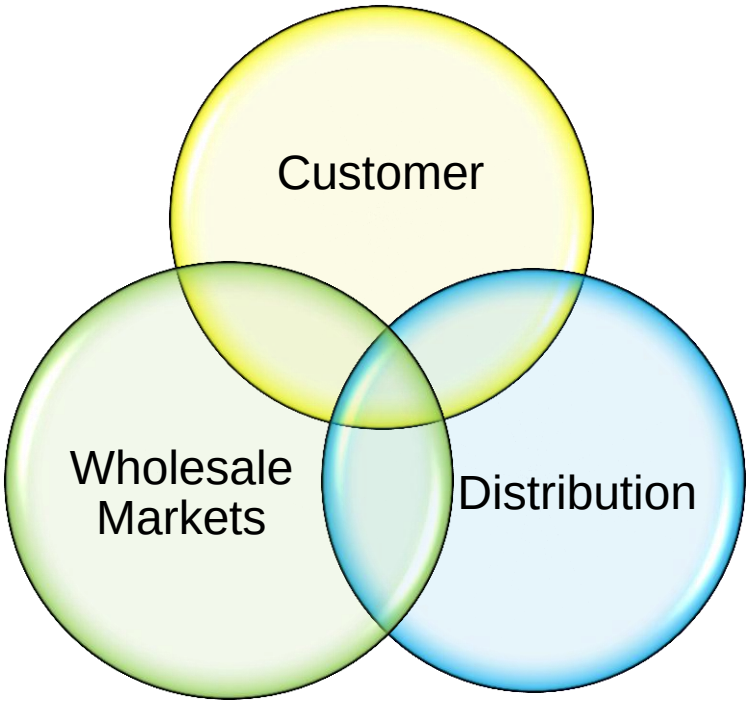
  To enable distributed energy storage systems to stack incremental value and revenue streams by delivering multiple services to the wholesale market, distribution grid and end users. Achieving this vision increases the value of storage, and potentially other forms of distributed energy resources, and enhances its economic viability and cost-effectiveness.

- **Problem Statement**

  Due to regulatory and/or market barriers, current market rules do not support the stack of incremental values that distributed energy storage systems can provide to the wholesale market, distribution grid, and end users. As a result, energy storage cannot yet provide the full scope of multiple benefits and services it is capable of to realize its full economic value to the electricity system.

Multi-Use Application: Types of Services

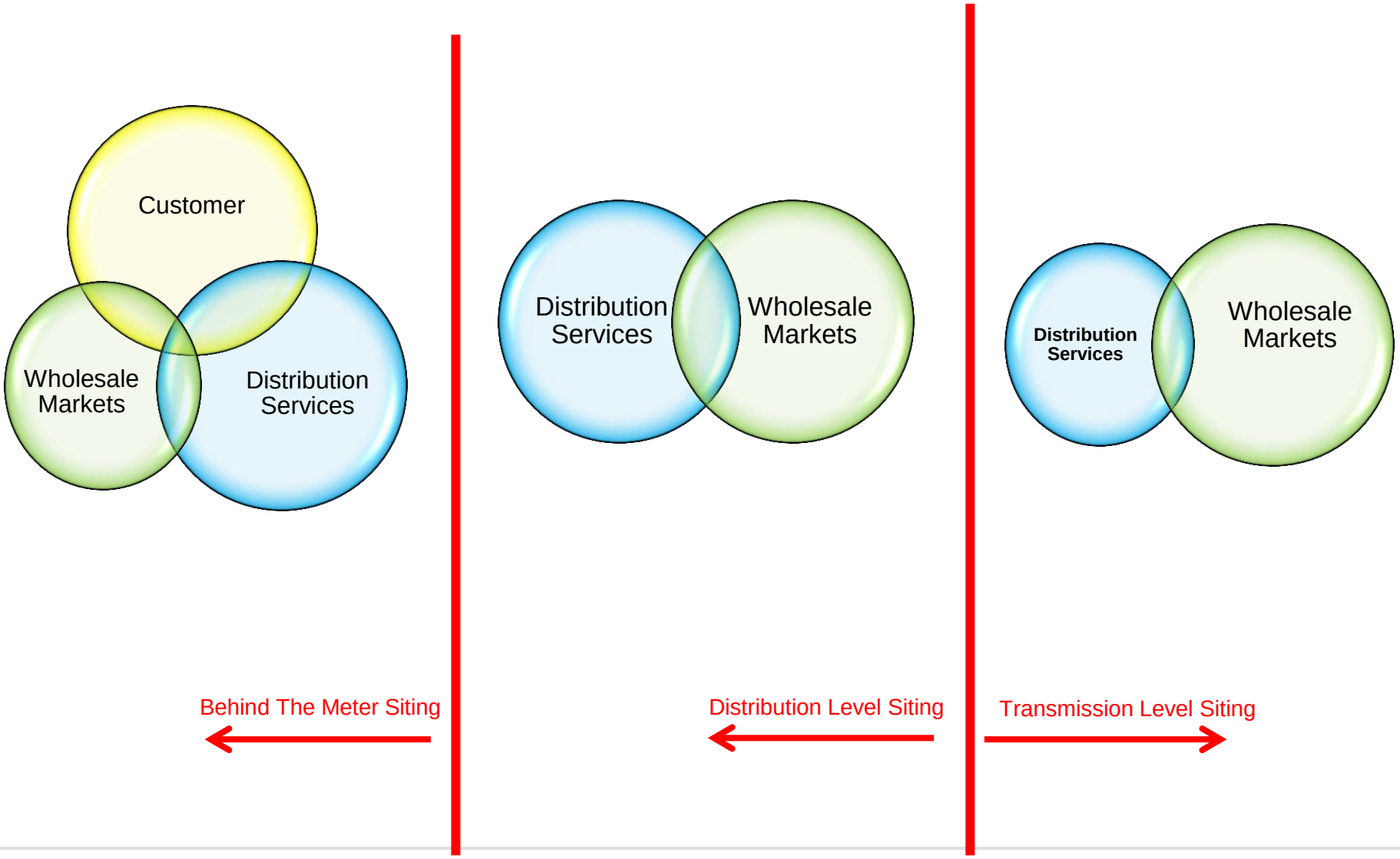
Time of Use Bill Management
Demand Charge Reduction
Back-up Power
Increased solar self-consumption



Energy
Regulation
Contingency Reserve
Resource Adequacy
Flexible Capacity
Flexible Ramping

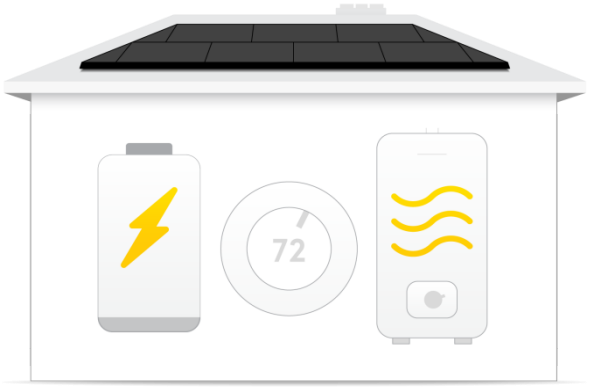
Distribution Infrastructure deferral
Reactive Supply
Voltage Control
Frequency Response

Behind the Meter Provides Multiple Use Opportunities

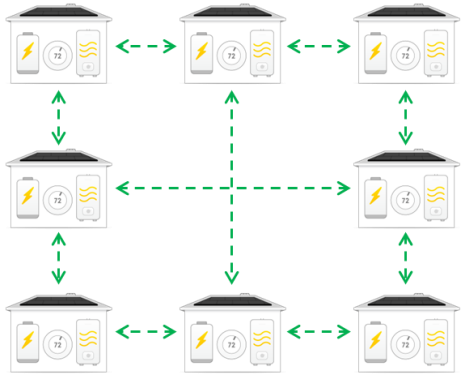


Technology portfolio can help accelerate grid modernization and multiple use applications

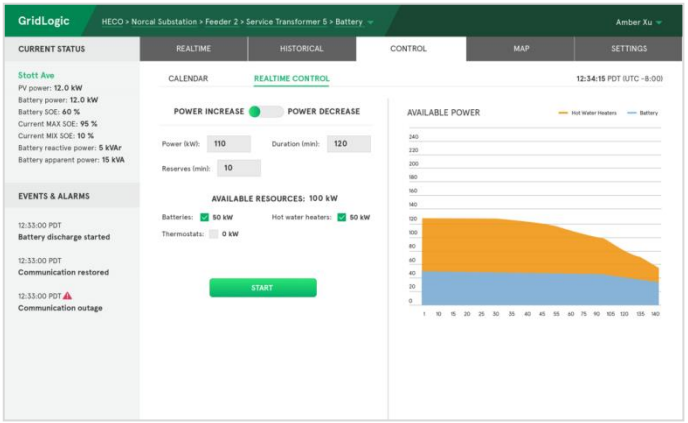
Smart Energy Homes



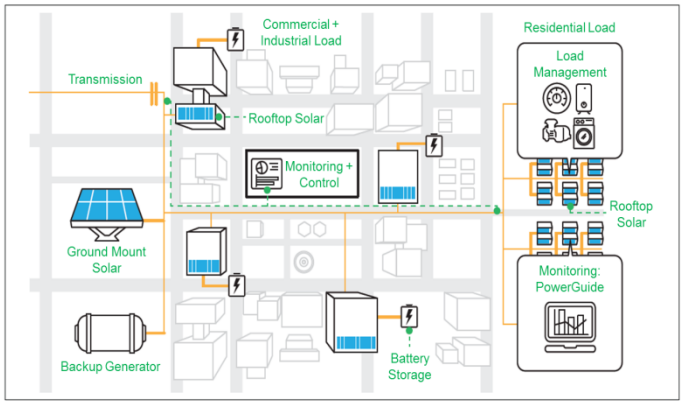
DER Aggregation



Grid Control Systems



Microgrids



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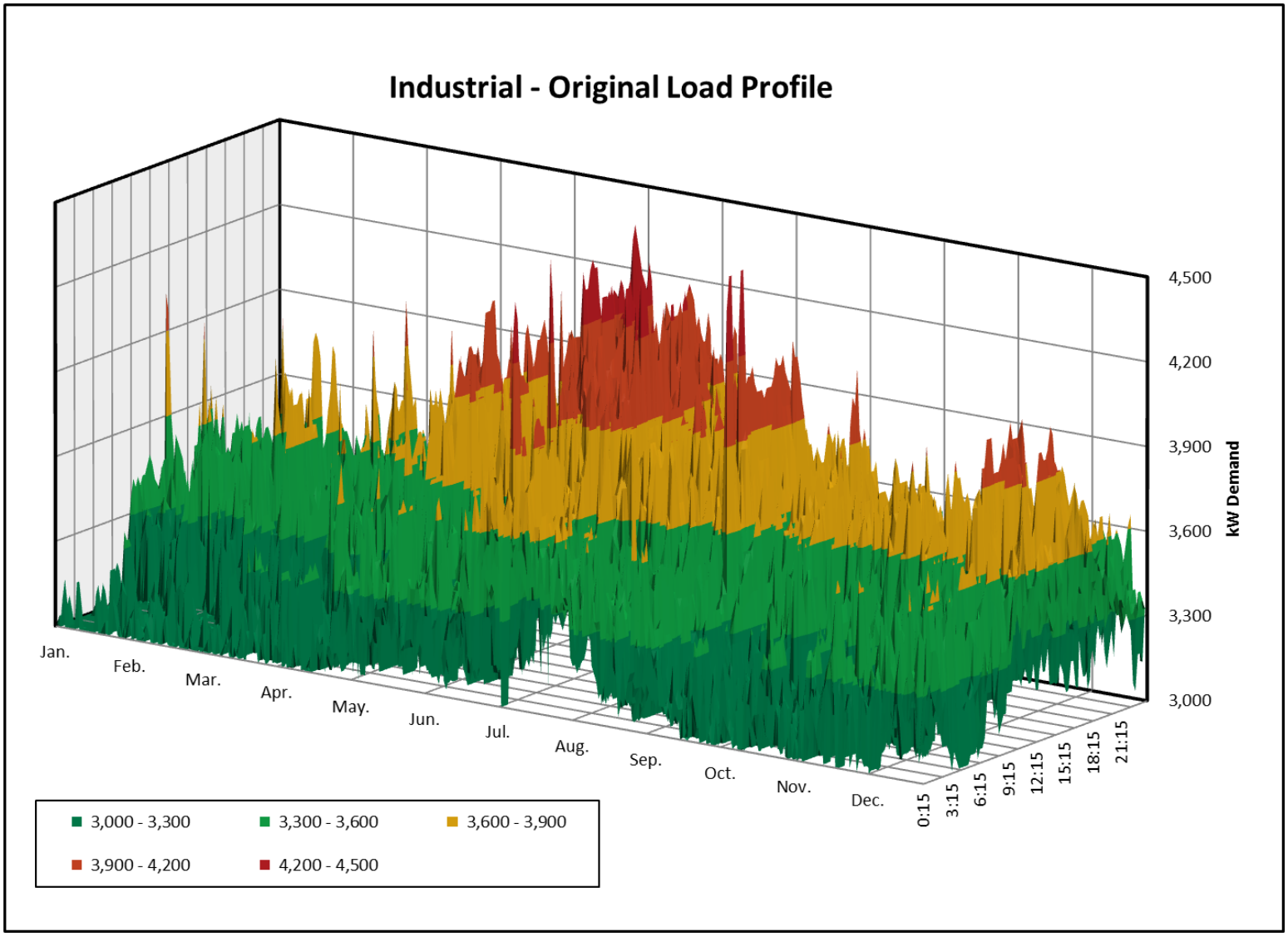
Example Project

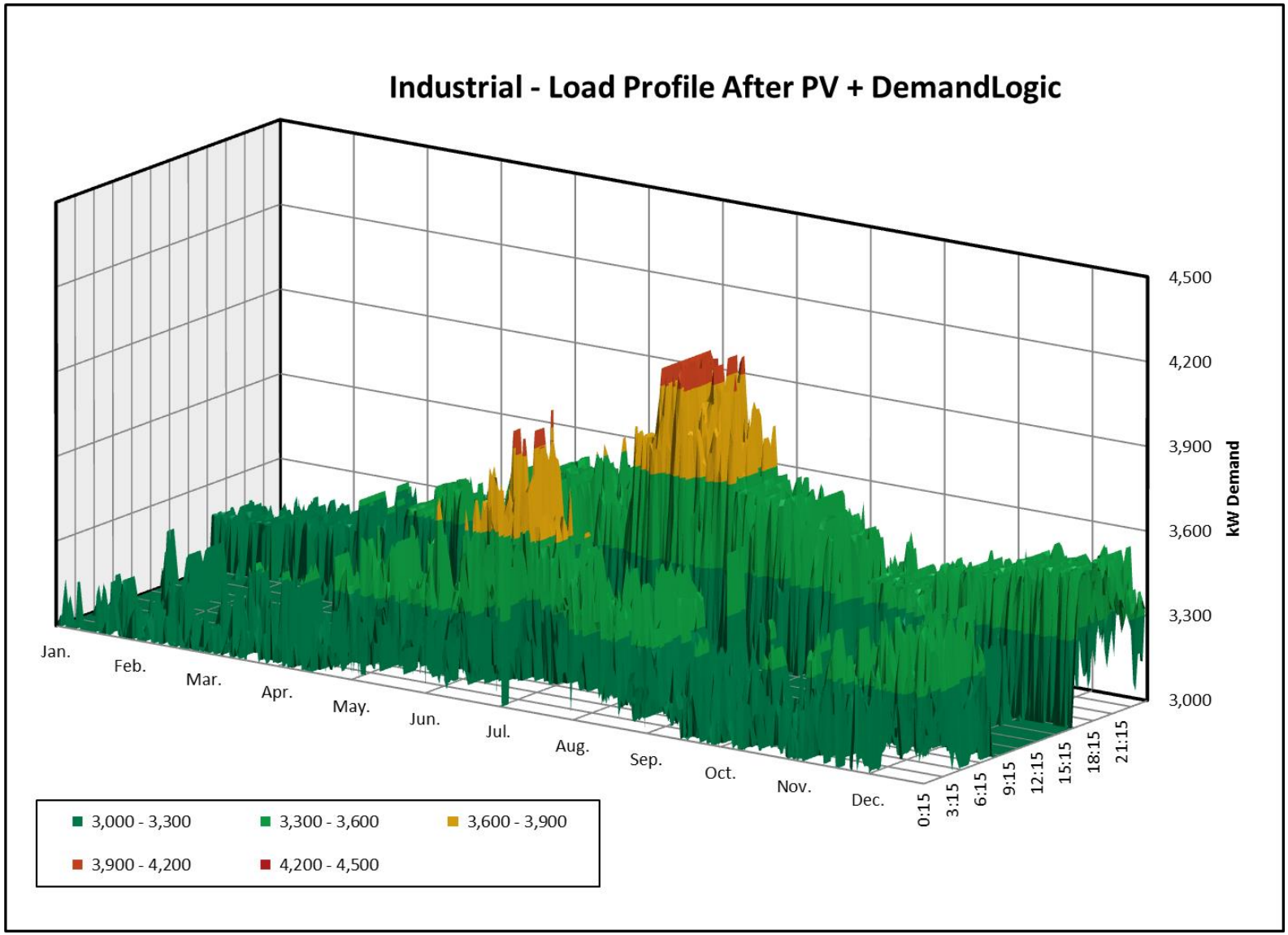
- Behind-the-meter solar+storage project SolarCity developed in SDG&E territory for commercial customer
  - Solar system size 4.7 MW
  - Storage size 1MW/2MWh

- Project Received Permission To Operate on 4/22/2016

Industrial – Original Load Profile

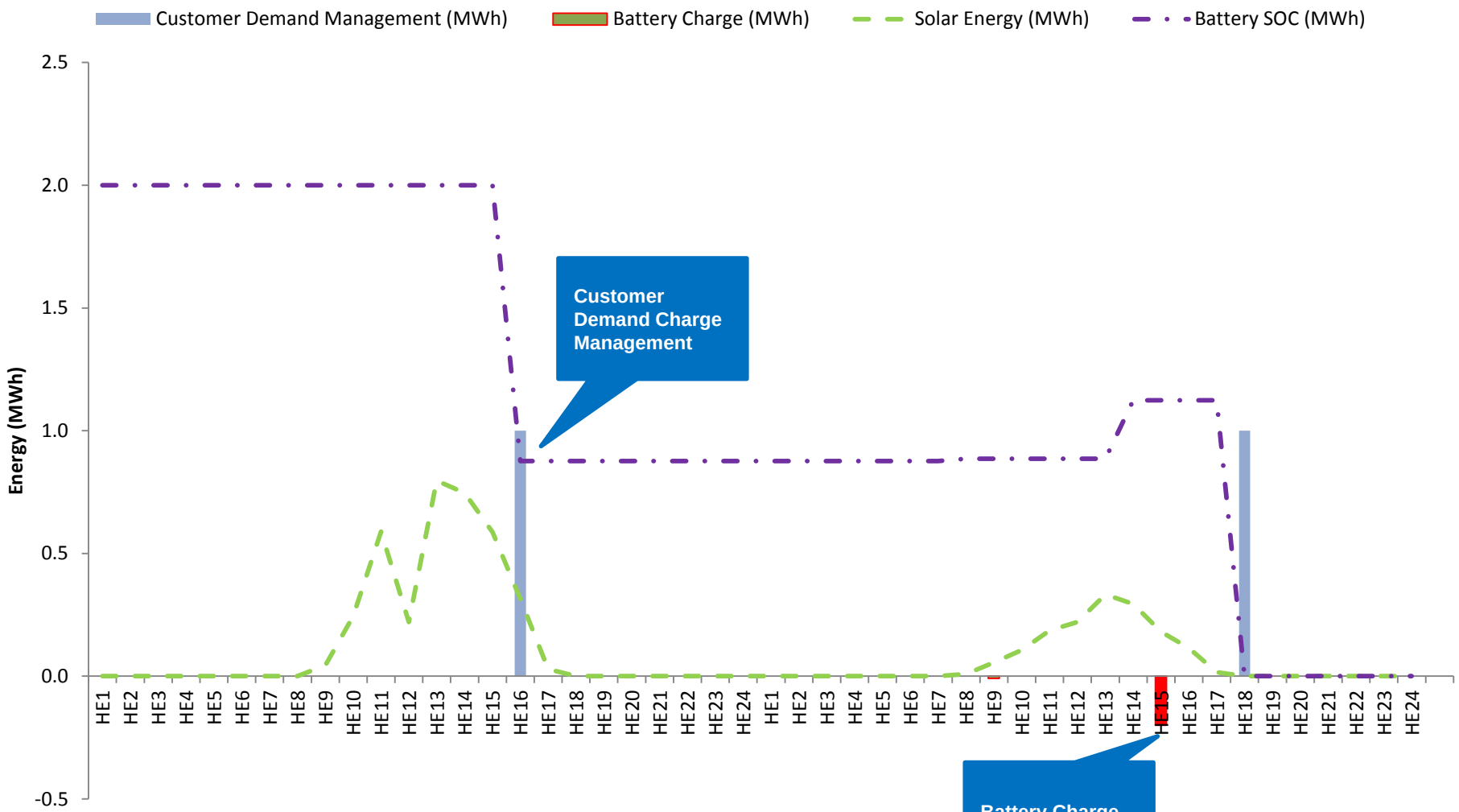


Industrial – Load Profile with DemandLogic



Multi-Use Applications Project Simulation 1
Current Capability: Customer Demand Optimization

Customer



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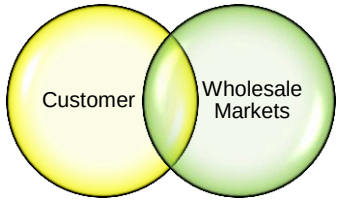
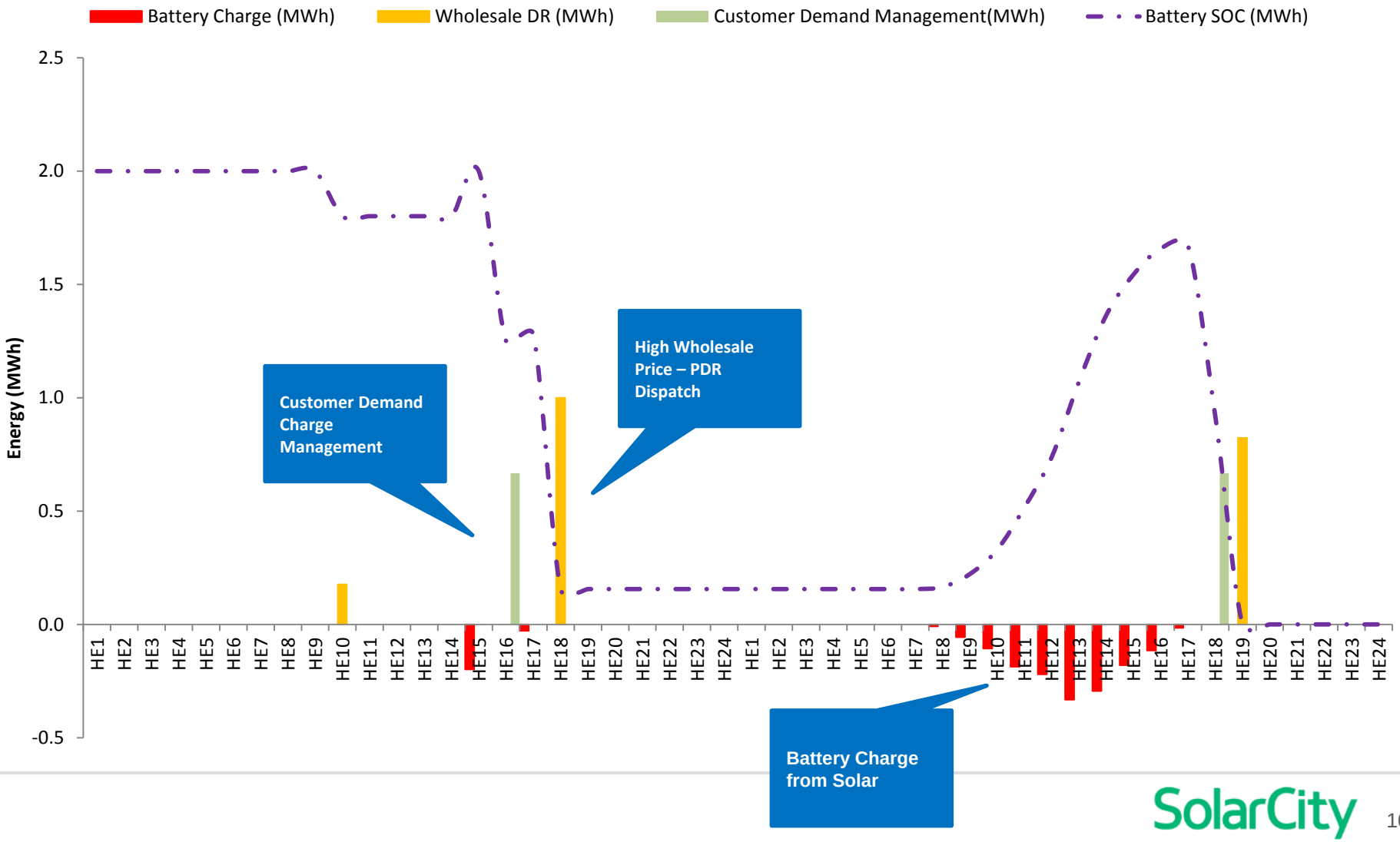
Multi-Use Applications Project Simulation 2

Future Plan: Customer + Wholesale DR





Requirements for Multi-Use Applications
Streamlined Interconnection – Do Not Enforce WDAT for all Sub-Resources

Barrier

- **Wholesale Distribution Access Tariff (WDAT) should not be applied to each sub-resource of DER aggregation**
  - WDAT process includes many phases and each phase can be costly and burdensome
  - WDAT Interconnection request require $800 non-refundable fee and if detailed studies are needed study deposits can go up to $15,000
  - The timing and costs for WDAT imposes an unnecessary economic burden on customer adopting DERs to provide benefits to the grid
  - Local utility distribution company and local regulatory authority should have the jurisdiction determine the interconnection process that may be necessary

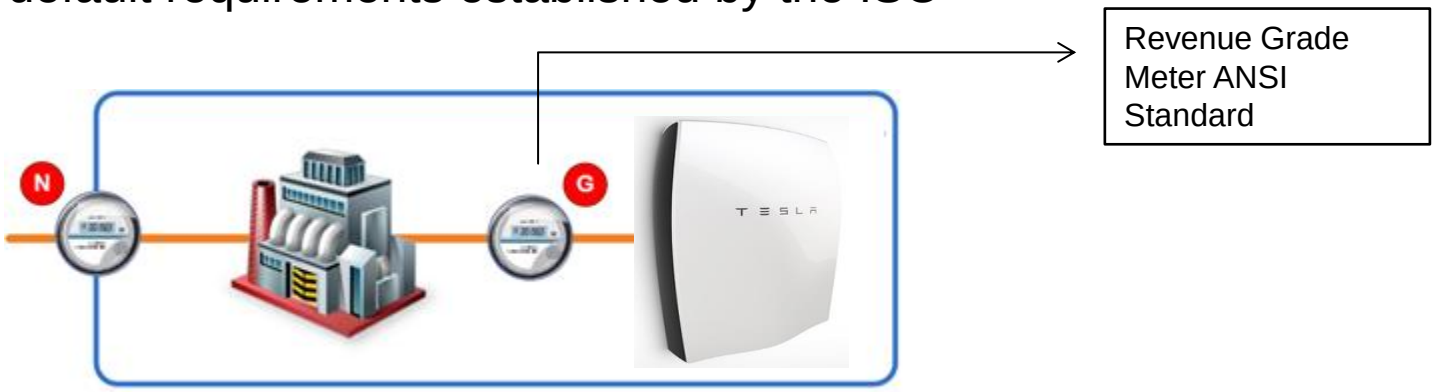
Key Takeaway

Streamlined Interconnection – Do not Enforce WDAT for all Sub-Resources

Interconnection rules/processes should be simplified to avoid costly/timely project development

Requirements for Multi-Use Applications
Cost Effective Metering

- **Revenue measuring devices meet the requirements of the appropriate local regulatory authority**
  - If the relevant local regulatory authority has not prescribed any certification criteria for the metering facilities of DER, scheduling coordinators must ensure their meters or revenue measuring devices meet the default requirements established by the ISO



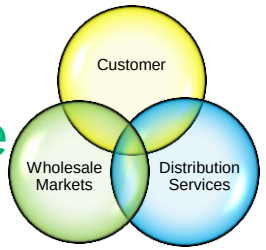
Key Takeaway

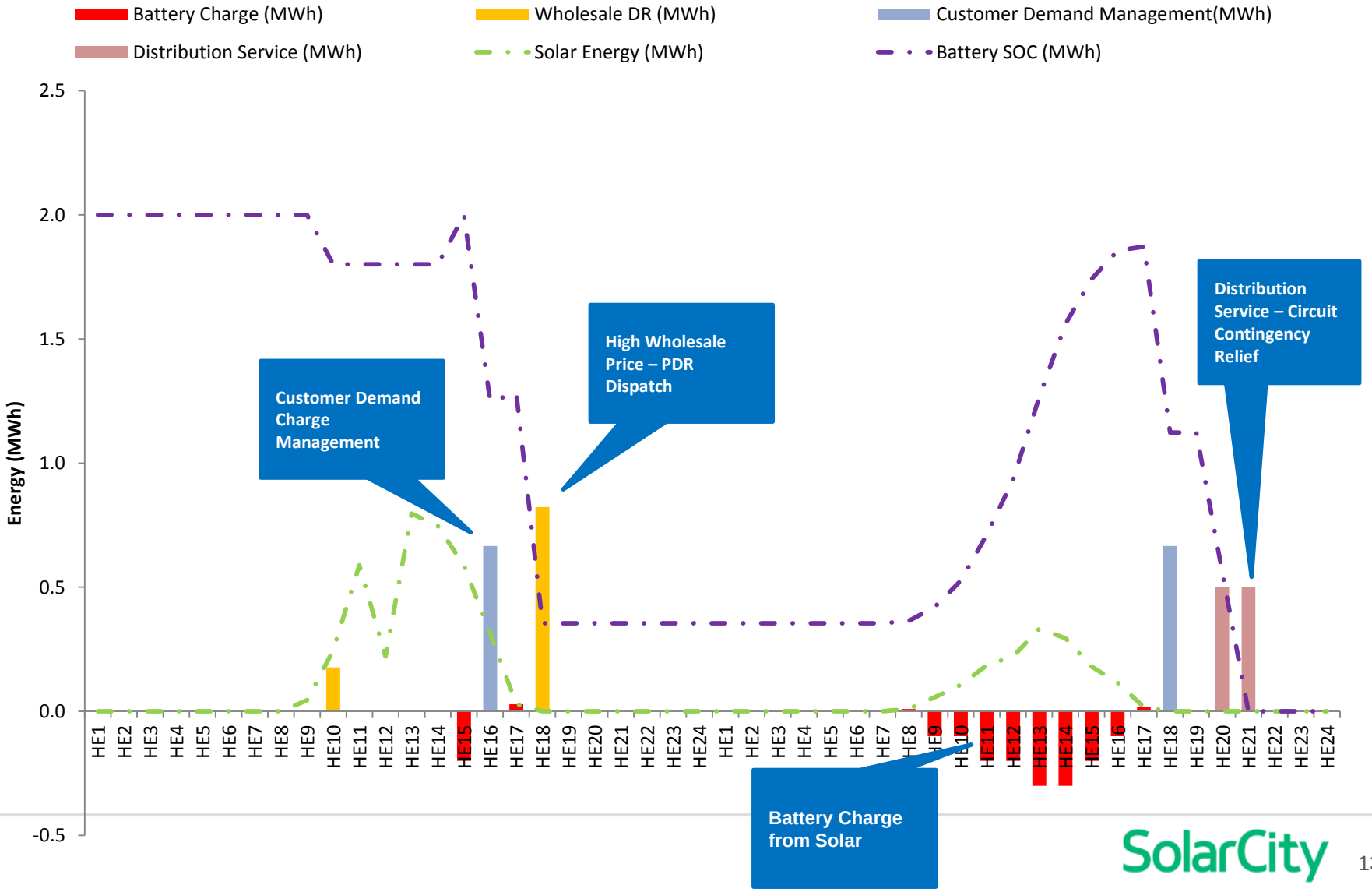
Cost Effective Metering

Reduce customer costs by avoiding redundant installations of revenue grade meters

Multi-Use Applications Project Simulation 3

Future Plan: Customer + Wholesale DR + Distribution Service





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Requirements for Multi-Use Applications
Distribution Products

- **Utility Distribution Companies need to articulate specific needs and define standard products that could be procured by third parties**
- Product definition must be targeted to actual need and not overly general
- Create pricing, procurement mechanisms which third party providers can monetize
- Improved coordination between ISO and utility distribution company to ensure reliable operation
- Improve coordination across relevant CPUC proceedings

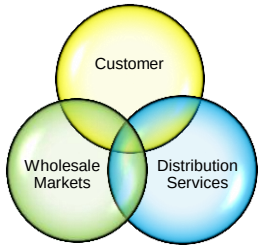
Key Takeaway

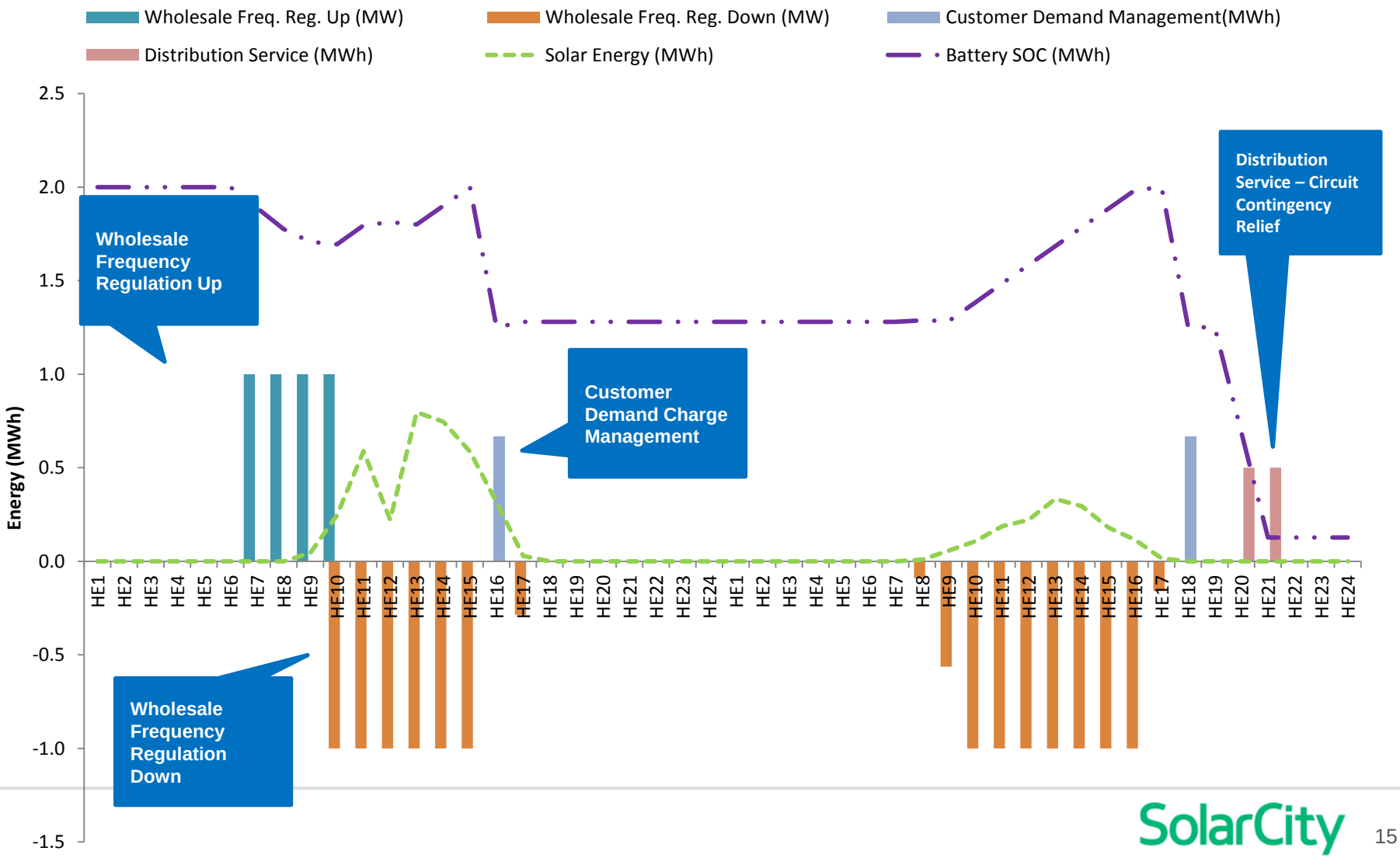
Distribution Product Development

Define distribution needs, develop standard products, create pricing mechanisms. Hold an additional workshop to discuss utility needs and data transparency within the DRP and IDER proceedings

Multi-Use Applications Project Simulation 4

Future Plan: Customer + Distribution Service + Wholesale AS





Requirements for Multi-Use Applications
Wholesale Market Design

- **Develop Market Products that Accommodate Multi-Use Applications**
  - Create opportunities for distributed storage to increase load
    - Only practical when financial settlements for retail load are appropriately accounted for
  - Move beyond the constraints of Demand Response
  - Allow Proxy Demand Resources (PDR) to provide frequency regulation
- **Create Market Rules that Do Not Overly Constrain Bidding and Performance**
  - Improve baseline methodologies that can accommodate multi-use applications
    - Metered Generation Output is a great step forward but should be built upon to accommodate ancillary services including frequency regulation
  - Avoid un-economic bidding constraints
    - Example is Net Benefit Test Price for behind-the-meter DERs

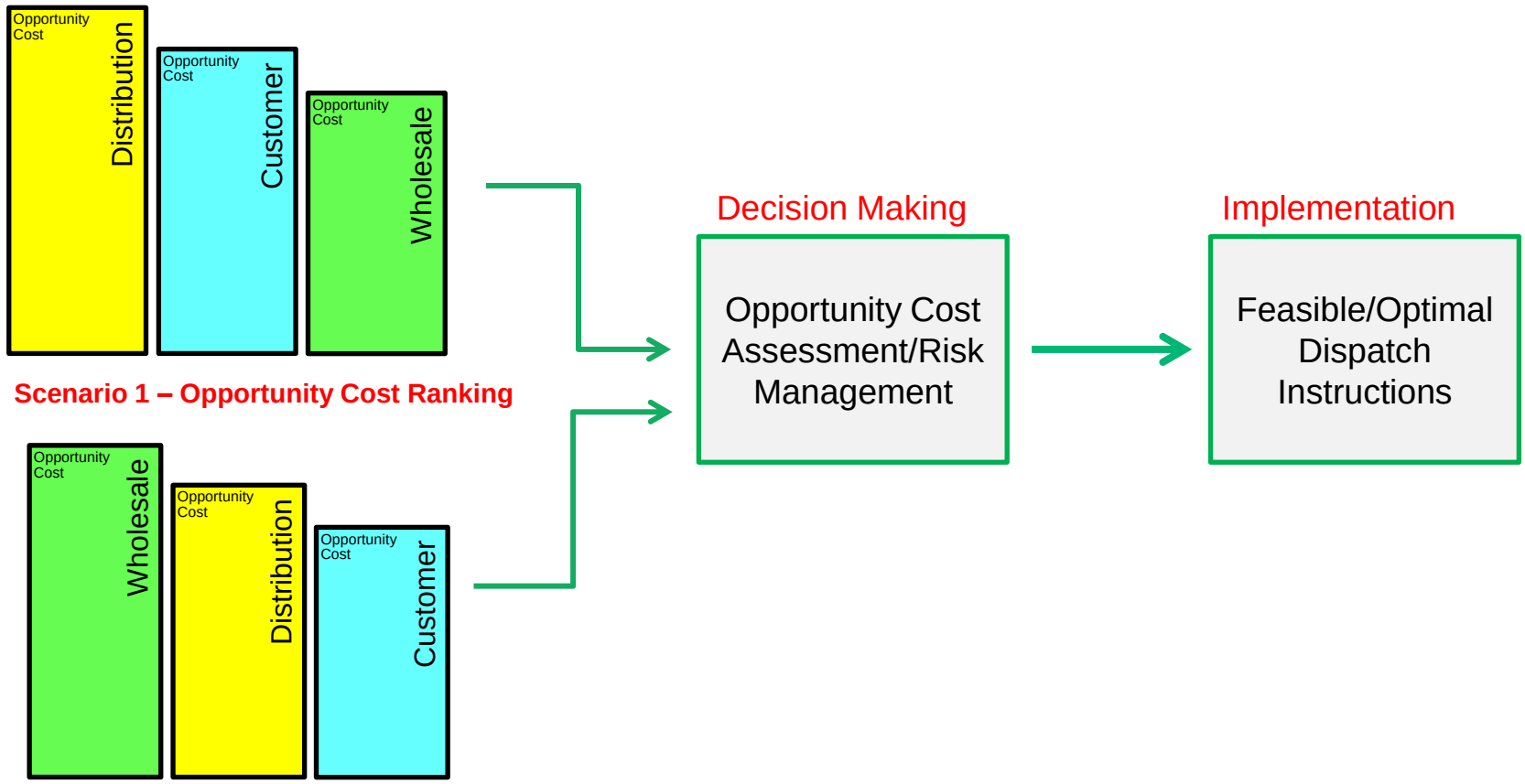
Key Takeaway

Wholesale Market Product Development

Develop market product and establish rules that can accommodate multi use applications as outlined

How Should Conflicting Real-Time Needs Be Managed?

- Managing real-time services is a risk assessment/opportunity & cost decision that asset owners can make
- Baseline adjustments developed by CAISO ensure incremental grid value



Conclusion

- Following developments are needed to enable distributed energy storage systems to stack incremental value and revenue streams to provide benefits to the grid and customers

Streamlined Interconnection - Do not Enforce WDAT for all Sub-Resources

Interconnection rules/processes should be simplified to avoid costly/timely project development

Cost Effective Metering

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Wholesale Market Product Development

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Thank you

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